



Reducing Risks

Hanford Site
**FACILITY
STABILIZATION**
Progress Report

August, 1998



U.S. Department of Energy
Richland Operations Office

Reducing Costs

FACILITY STABILIZATION PARTNERSHIP

Hanford cleanup progress is a major interest for our state politicians, as well as our many regulating partners, including the Department of Ecology and the Environmental Protection Agency. Frequent news media visits help us keep the public well informed.



ABOVE: Al Alm, then Assistant Energy Secretary, left, with Tri-City Herald reporter John Stang and State Representative Shirley Hankins. RIGHT: State Senator Pat Hale, with previous Fluor Daniel Hanford President Hank Hatch, center, and local businessman and long-time Hanford friend, Sam Volpentest.

The Project Hanford Management Contract has ushered in a new partnership between the U.S. Department of Energy, Fluor Daniel Hanford and B & W Hanford Company. With it has come an aggressive strategy to deal with two key problems. The first is the need to reduce the serious risks posed by Hanford's aging nuclear materials processing facilities. The second is the need to reverse the rising costs required to keep these buildings safe until they can be cleaned out and closed.

To address these problems we are building stronger partnerships with regulators and the Hanford Advisory Board to make sure the work we do meets regulatory and stakeholder expectations. In some cases, without their direct involvement we could not have met our objectives on time.



RIGHT: From left, Jim Mecca and Loren Rogers, both of DOE-RL, with Al Alm, former Assistant Energy Secretary.

Hanford teams with regulators

The Washington State Department of Ecology was involved right from the start in PUREX planning. Up-front partnering sessions were held to decide how the facility was to be deactivated since regulations require closure but that would have been very costly and would not have provided benefit for the resources spent. A similar partnering approach contributed to the successful B Plant deactivation.

At PUREX, the Washington State Department of Health was willing to look at an innovative approach of showing that the deactivation did not have the potential to exceed radioactive air emissions beyond what occurred during operations.

In addition to these State partners, Facility Stabilization progress in cleanup activities is also attributed to open partnerships with the U.S. Environmental Protection Agency, the Hanford Advisory Board (HAB) and the Defense Nuclear Facility Safety Board. These stakeholders play a strategic role in helping us ensure successful completion of cleanup priorities.

BELOW: From left, Moses Jarayssi, Department of Ecology, Hank Hatch, previous Fluor Daniel Hanford president, Al Alm, former Assistant Energy Secretary and Doug Sherwood, Environmental Protection Agency.



PRODUCES RESULTS

More than 400 facilities, many built during World War II, contain a variety of chemical and radioactive materials that must be safely removed or stabilized if we are to prevent contaminants from being released to the atmosphere or penetrating the soil and entering the groundwater and eventually the Columbia River.

Hundreds of millions of dollars are spent annually to protect the environment, the public and our workers from these hazards and the cost increases each year.

In this first report on the progress and issues relating to Facility Stabilization, we document progress to accelerate the deactivation of Hanford's old processing

facilities, cut costs, reduce the burden to taxpayers and reduce the overall risks.

Recent accomplishments put Hanford well on its way toward the safe, cost-effective progress the public expects and deserves.

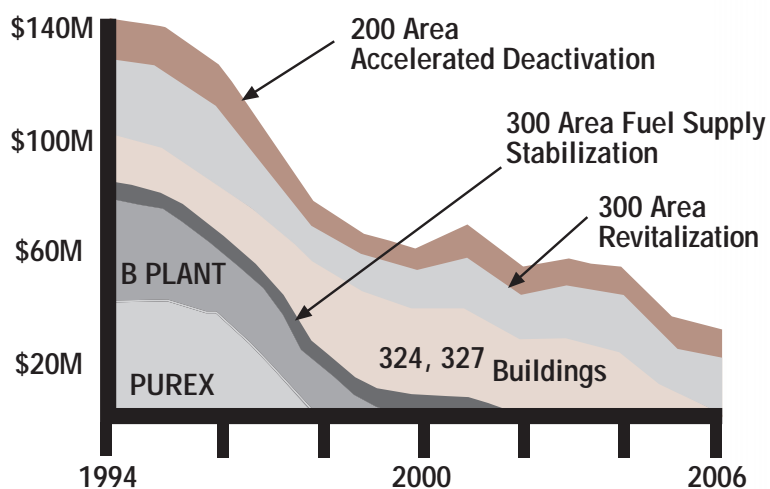
It has been a time of challenge and change since the new contract was put in place in October 1996. There are still issues confronting us that must be resolved if we are to achieve the mandate of safe, cost-effective cleanup, but our accomplishments show we are clearly moving in the right direction. ♦

EXECUTIVE MANAGEMENT TEAM



(from left) Art Clark, B&W Hanford
Larry Olguin, Fluor Daniel Hanford
Pete Knollmeyer, DOE-RL

Facility Costs



Dramatic drops in facility costs are realized as plants undergo deactivation.

HIGHLIGHTS:

- ✓ Completed deactivation of PUREX ahead of schedule, saving \$75 million
- ✓ Sharing deactivation experience and success at Plutonium/Uranium Extraction (PUREX) Plant and B Plant throughout the DOE complex
- ✓ On target to close B Plant four years ahead of schedule saving \$100 million
- ✓ Preparing Waste Encapsulation & Storage Facility to stand alone as a model nuclear materials storage facility
- ✓ Improved safety at Plutonium Finishing Plant
- ✓ Removed more than 8 million curies from the 300 Area

PUREX: *A \$75 MILLION SAVINGS TO TAXPAYERS*

HIGHLIGHTS:

✓ Closed PUREX one year ahead of schedule, reducing risk while saving \$75 million in shutdown costs

✓ Closure was a breakthrough achievement, reducing annual maintenance cost by \$32 million

✓ Facility Stabilization and Environmental Restoration team, known as FASTER, was assembled to apply lessons learned throughout the DOE complex

✓ FASTER team expertise supported deactivation projects at Rocky Flats, Savannah River and Brookhaven National Laboratory

The deactivation of Hanford's Plutonium/Uranium Extraction (PUREX) plant is one of Facility Stabilization's most important accomplishments. It was possible only with the strong participation of the regulators (EPA and Ecology) and the Hanford Advisory Board. Lessons learned from this pioneering achievement are now being shared throughout the DOE complex, helping other sites speed deactivation of contaminated facilities to reduce risks while lowering costs.

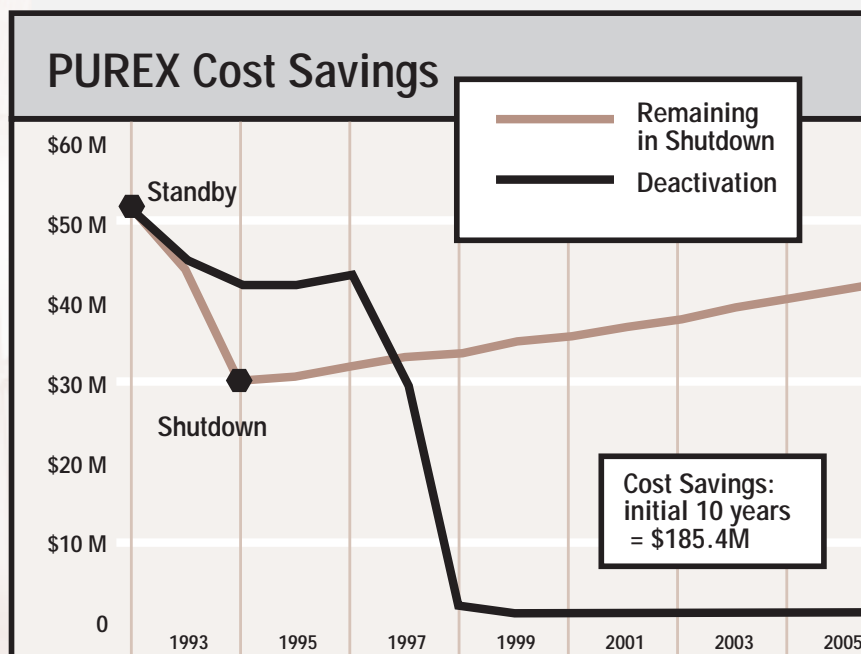
We finished the project 16 months ahead of schedule and \$75 million below the projected cost.



Dan Richardson, Health Physics Technician, left, and Mike Bryant, Nuclear Plant Operator perform bagout during PUREX deactivation.

Reducing the risk reduces the cost

PUREX was once the backbone of America's Cold War plutonium production complex. When it was shut down in 1992, it contained plutonium solutions, irradiated fuel, contaminated chemicals and residual plutonium oxides, all of which posed risks and hazards to workers and the environment.



Accelerating building deactivation at PUREX reduced risks and related costs.

PROJECT MANAGEMENT TEAM

The annual cost to taxpayers of safely maintaining the plant has been significantly reduced from \$32 million per year, to less than \$700,000.

Sharing knowledge within DOE complex

A core team, known as FASTER (Facility Stabilization and Environmental Restoration) was assembled from the PUREX deactivation staff to apply the lessons learned to other cleanup projects. The FASTER team experts provide critical expertise and guidance to other Hanford projects, as well as to projects at Rocky Flats, Savannah River and Brookhaven National Laboratory.

Based on their experience, the FASTER team members conduct project consultation workshops, support project management planning, assist with regulatory strategies and help perform job hazards analyses.

The FASTER team developed a unique planning software package which is now in use within the DOE complex. Additional support is provided with equipment removal strategies, dismantlement techniques, detailed work planning, decisions on final waste forms and surveillance and maintenance improvements.

Because of its outstanding success, the FASTER team has become integral to a national deactivation emphasis in the Department of Energy's Environmental Management program.

Activities of the FASTER team are co-managed by representatives from DOE headquarters and Hanford. ❖



(from left) George Reddick, Fluor Daniel Hanford
Bill Bailey, B&W Hanford
Kimberly Williams, Dave Evans,
Loren Rogers, DOE-RL
Larry Romine (not pictured), DOE-RL



Assistant Energy Secretary Al Alm and DOE-RL Assistant Manager Lloyd Piper, seated, participated in ceremonies celebrating accelerated deactivation of the Plutonium/Uranium Extraction (PUREX) plant at Hanford. The plant was deactivated 16 months ahead of schedule and \$75 million under budget. Deactivation of PUREX cut the annual surveillance and maintenance costs by \$32 million per year.

B PLANT: \$100 MILLION SUCCESS THROUGH INNOVATION

HIGHLIGHTS:

- ✓ On schedule to close B Plant 4 years early
- ✓ Early closure will save \$100 million
- ✓ Closure will reduce annual cost to taxpayers by \$20 million
- ✓ Separating B Plant support systems from Waste Encapsulation & Storage Facility (WESF) so WESF can stand alone

B Plant, one of Hanford's original World War II nuclear materials processing plants, is on track to close by the end of fiscal year 1998, four years ahead of schedule and \$100 million below projected costs. **In addition, closure of B Plant will save the taxpayers an additional \$20 million per year in surveillance and maintenance costs.**

This remarkable achievement is the result of B Plant drawing on lessons learned from deactivation of the Plutonium/Uranium Extraction (PUREX) plant. B Plant applied the principles of reengineering with a commitment to speed the work and cut the cost.

Shutting down has been easier said than done. The adjoining Waste Encapsulation & Storage Facility (WESF), must continue to safely store the nearly 2,000 strontium and cesium capsules into the next century. WESF

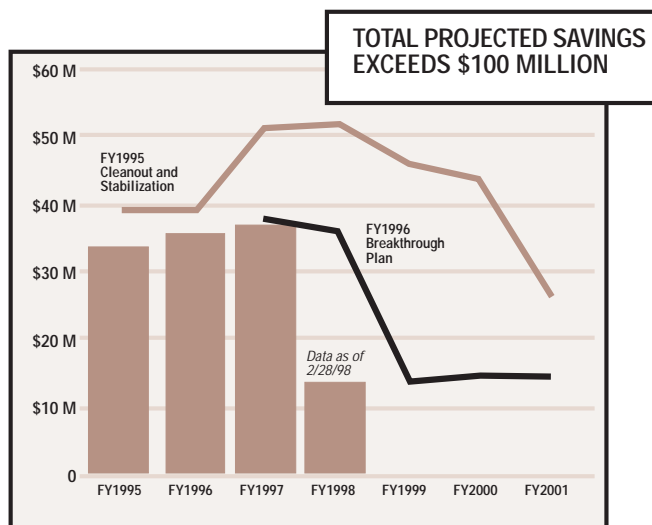


B Plant was built during World War II to process plutonium.

has utilized B Plant systems for water deionizing, solid waste handling, emergency ion exchange water treatment, liquid effluent and liquid waste storage and disposal. While the WESF structure will remain physically attached to B Plant, its shared systems have to be decoupled so WESF is able to stand alone as a model nuclear materials storage facility.



CEO magazine writer Jack Mayne, right, toured B Plant in April with then B Plant Director, Bob Heineman.



B Plant early plant deactivation projected cost savings.

PROJECT MANAGEMENT TEAM

The canyon inside Hanford's B Plant BEFORE deactivation work.



(from left) Dave Evans, DOE-RL
Bob Heineman, Jr., B&W Hanford
George Reddick, Fluor Daniel Hanford
Bill Bailey, B&W Hanford, not pictured

Tasks for decoupling major operating systems to allow WESF to stand alone

- ✓ Installed Emergency Ion Exchange System (EMIX) (finished)
- ✓ Solid waste handling program had to be established (finished)
- ✓ De-ionized water treatment system had to be constructed (finished)
- ✓ Non-radioactive liquid effluent control system had to be transferred to WESF to send liquids to the 200 Area Treated Effluent Disposal Facility independent of B Plant (finished)
- ✓ Low level radioactive liquid waste treatment system still under construction (final September, 1998)



The canyon inside Hanford's B Plant AFTER deactivation work.

Deactivation will be completed by September 30, 1998. When finished, surveillance and maintenance costs will be reduced to approximately \$750,000, compared to \$20 million per year before deactivation began. ❖

WESF: *LARGEST CONCENTRATION OF RADIOACTIVE MATERIAL IN U.S.*

HIGHLIGHTS:

- ✓ Transforming WESF into a model nuclear storage facility is on schedule
- ✓ Four of five major operating systems shared with B Plant have been successfully decoupled
- ✓ A new operations control center has been constructed
- ✓ Safety documents reflecting the new WESF mission have been completed



DynCorp riggers Don McCrumb, Ray Powers and Fred McClure prepare to stage one of the modules of the Emergency Ion Exchange System.

Nuclear Process Operator Gary Johnson checks the integrity of a capsule in the WESF storage pool. The capsules contain approximately 150 million curies of radioactivity.

PROJECT MANAGEMENT TEAM

While most of the Facility Stabilization mission is focused on deactivating contaminated buildings, there is one exception. The Waste Encapsulation and Storage Facility, which stores 1,929 capsules of highly-radioactive strontium and cesium, must be made ready for continued safe, long-term operation.

The capsules stored in WESF contain approximately 150 million curies of radioactive material, making it the largest concentration of radioactive material in the United States. The material must be safely stored in WESF for another two decades. WESF is being upgraded into a model nuclear materials storage facility until the material can be prepared for disposal.



Cesium chloride storage capsule, about 22 inches long

WESF stores the capsules in a large pool of water. The water cools the capsules and shields workers from their intense radiation. These high-energy radiation sources were removed from Hanford's high level waste years ago to prevent boiling in the underground storage tanks.

Since WESF operations began, it has relied on B Plant for many of its operating support systems. With

B Plant being shut down at the end of this fiscal year, WESF had to be "decoupled" so it could safely operate on its own, awaiting final disposition of the capsules.



(from left) Dave Evans, DOE-RL
George Reddick, Fluor Daniel Hanford
Kimberly Williams, DOE-RL
Bill Bailey, Bob Heineman, B&W Hanford
Loren Rogers, DOE-RL

To achieve this transformation and meet the accelerated B Plant closure schedule much has to be done. A new control center was constructed, a closed-loop cooling system was installed and new safety documentation was written. A new waste-handling system also was implemented. A new emergency water purification system was installed in case a capsule ever leaks material into the cooling water. Nearly all of this work is complete and WESF will be on its own by the end of fiscal year 1998.

Present plans call for disposal of the cesium and strontium capsules as high level waste beginning in about 2013 and continuing until 2017. Until then, the capsule storage systems in WESF must be fully operational to ensure against environmental releases, worker exposure and risk to the public. Deactivation of capsule storage and monitoring systems will begin after all of the capsules are removed. ♦

PFP: *AMERICA'S SECOND LARGEST PLUTONIUM INVENTORY*

HIGHLIGHTS:

- ✓ Halted routine movement of fissile material to improve procedure compliance
- ✓ Revamped procedures and retrained workforce
- ✓ Resumed the first phase of Pu operations
- ✓ Initiated operational readiness review assessment to resume the next phase of routine operations
- ✓ Commenced PFP reengineering activities
- ✓ Completed recovery from May 14, 1997 chemical explosion in Tank A-109
- ✓ Completed installation of vertical calciner system for stabilizing plutonium solutions

One of the greatest challenges facing the Facility Stabilization Project is the deactivation of Hanford's Plutonium Finishing Plant (PFP). The facility poses Hanford's largest plutonium hazard and represents one of Hanford's greatest risks. It is also among the most expensive to maintain due to the nature of the material stored in the building, the age and construction of the building and the cost of security.



A
plutonium
button

PFP accomplished many missions

Built in 1951, PFP is an old facility with aging support systems. PFP converted plutonium liquids and powders into metal for use in nuclear weapons. It was also used to reclaim plutonium from scrap materials that accumulated during normal operations.

PFP safely stores the second largest inventory of plutonium in the United States.

PFP last operated in 1987 but still stores the second largest plutonium inventory in the United States. This includes four metric tonnes of plutonium in its vaults and more than 13 metric tonnes of plutonium-bearing materials that must be properly stabilized and packaged. These include scrap material, liquids, metals and oxides.

Plutonium must be monitored continuously for reasons of national security and presents special hazards that must be taken into account by workers performing cleanup.

The amount of plutonium in each container and the spacing of the containers is carefully controlled at all times to avoid criticality hazards. Plutonium-containing materials include glove boxes, ducts, ventilation systems, piping and processing equipment throughout the PFP processing areas. These pose a substantial cleanup task as well as a hazard to workers.

Plutonium is still the major hazard

Because of the risk and the need to maintain security, the cost to taxpayers of keeping the plutonium safe is high. The proposed path to reduce the risk and the cost is to stabilize and repackage the plutonium and ship it to another Department of Energy facility specially designed for plutonium storage. This is expected to occur between 2002 and 2005. At that point, the security cost of maintaining

Ed Wallace attaches an insulator to an adapter in preparation for calorimetry.



PFM will drop by nearly 75 percent from the current \$60 million annual budget.

Plutonium is extremely toxic and must be managed to preclude releases. Problems with existing packaging have recently become apparent. The plutonium inventory is in different physical and chemical forms and in various types of containers. Many of the containers are decades old and deteriorating. Stabilization and repackaging of the plutonium is one of Hanford's top priorities.

Stabilization activities have run into some obstacles. All but essential safety and security operations at PFM were shut down in December 1996 due to procedural infractions by facility personnel. An explosion in a chemical storage tank in May 1997 further disrupted waste stabilization activities. These problems have been corrected through a series of extensive and aggressive actions, and the first phase of normal activities has resumed. Resumption of other stabilization activities will begin later this year.

Prior to restrictions being imposed on normal operations, more than 340 kilograms of plutonium-bearing materials had been stabilized. In the meantime a strategy has been proposed that will allow for accelerated closure of PFM and offsite shipment of Hanford plutonium to another DOE facility.

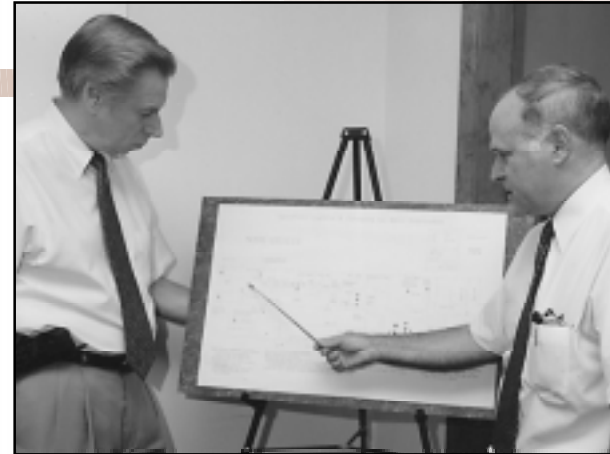
Restart of material stabilization activities is a high priority at PFM.

We can't afford to sit by and watch the problems get worse. History has shown us what can happen if we don't deal with risks before they become big problems.

Hanford cleanup funding is continuing to decline, making it all the more urgent that work resume safely and swiftly. Delay simply adds to the cost of keeping the plutonium safe and secure. When the plutonium hazard is eliminated, a large portion of the hazard control cost will be eliminated and security costs will go down.

To help reduce costs and speed the deactivation work, the facility is being reengineered to streamline the process and increase productivity. These techniques were applied to other deactivation projects with stunning results. We expect the same for PFM.

To reduce the risk posed by PFM, we have installed equipment to treat plutonium-bearing liquids. We will cement bulk residues that contain plutonium and we will complete the high-temperature treatment of metals with a high plutonium content. **Our goal is to have all of the plutonium in PFM stabilized and shipped offsite by 2005.** ♦



(from left) Jerry Martin, Fluor Daniel Hanford
Fred Crawford, B&W Hanford
Don Seaborg, DOE-RL, not pictured

300 AREA: *REDUCING CHEMICAL AND RADIOLOGICAL RISKS*

HIGHLIGHTS:

- ✓ Removed more than 8 million curies from the 324 Building
- ✓ Reduced the risk to the Columbia River and the City of Richland
- ✓ Reduced exposure to workers
- ✓ Placed the material in safe, interim storage near the center of the Hanford Site
- ✓ Converting 300 Area to potential commercial industrial site
- ✓ Issued Closure Plans for 324 Building Radiochemical Engineering Cells, High Level Vault, Low Level Vault and Associated Areas Closure Plan
- ✓ Completed three shipments of low level waste from B Cell in 324 Building

Hanford's 300 Area is adjacent to the Columbia River and just north of the City of Richland. It has been the location of fuel fabrication and radiological research, creating a legacy of highly contaminated facilities and the accumulation of a large volume of radioactive materials. Safely moving these materials out of this area is one of our highest priorities.

One of our most significant achievements in the 300 Area has been the removal of more than 8 million curies of radioactive materials from the former Engineering Development Facility known as the 324 Building. The material has been safely moved to the center of the Hanford Site for interim storage where it poses significantly less risk to the public and the environment. It will be stored there until it can be prepared for its final disposal.

As significant as this achievement is, it represents only a portion of the total radioactive inventory in the 300 Area. We still have over 6 million curies remaining to be moved just from the 324 and the 327 Buildings.

These two buildings are among nearly 200 of Hanford's aging buildings in the 300 Area that must be safely deactivated to reduce the growing risk they pose to our workers and the environment. Many of the buildings are highly contaminated and close to the Columbia River.



DOE-RL Manager John Wagoner, second from left, and previous Fluor Daniel President Hank Hatch, far right, congratulate James McQuown, left, David Hare, center, and Bill Hooper for their quick emergency response to the finding of a vial of picric acid.

Among the 324 and 327 Building inventories are:

- 3 million curies in radiological and chemical mixed waste
- 2 million curies in spent fuel and radiological metallurgical samples
- 1 million curies of miscellaneous inventories including cesium powder and pellets, and fuel assembly pieces

A Deactivation Project Management Plan, similar to those used to guide closure of facilities elsewhere on the Hanford Site, has been drafted with a great deal of cooperation and collaboration with the regulators. This plan will help us continually improve our performance on this project.

In addition to removing the 8 million curies of glassified waste, we also

64 CENTS-A-CURIE DISPOSITION

PROJECT MANAGEMENT TEAM

removed aging reactor fuel pins totaling 26,000 curies of radioactivity and shipped them to the center of the site for safe, long-term storage.

We also completed the first phase of cleaning out the Waste Acid Treatment System (WATS) in the old 313 Building. WATS was built in 1975 to collect and process waste acids.

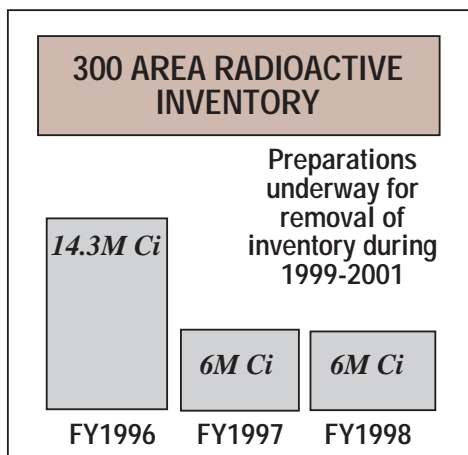
Additional risks include contaminated equipment and other solid waste buried in trenches. Lead and other heavy metals must be safely removed for disposal. We must also clean out wastes and contamination from components and chemicals used in the fabrication of reactor fuel.

When we conclude deactivation of the 300 Area, we will have stabilized and deactivated contaminated buildings to a safe, low cost condition.

Laboratory facilities will be deactivated and decommissioned and facilities attractive to commercial and light industries will be cleaned and made available for other uses. Buildings that can't be revitalized will be demolished, laboratory activities will be consolidated and the overall cost to taxpayers will be significantly reduced. ♦



(from left) Dave Templeton, DOE-RL
Manny DeLeon, Fluor Daniel Hanford
George Hayner, B&W Hanford



The PHMC inherited a 300 Area radioactive inventory of over 14 million curies (ci). In 1997 over 8 million curies were moved away from the Columbia River and the City of Richland at a cost average of 64 cents per curie. Work is now underway in 1998, gathering and packaging the remaining 6 million curies.



In 1997, the PHMC moved 8.3 million curies of radioactive inventory away from the Columbia River. Eliminating this risk is the equivalent of eliminating the radioactivity in three of Hanford's huge double-shell tanks.

CHALLENGE, CHANGE AND PROGRESS

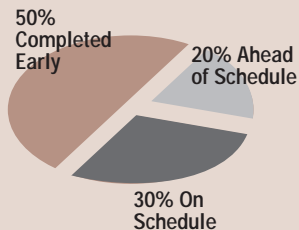
It has been a time of great challenge and change since the PHMC contract was put in place in October 1996. There are still many issues confronting us that must be resolved if we are to achieve the mandate of cleanup that the public expects and deserves. These issues should not overshadow the significant progress that has been made to meet the expectations of our stakeholders and regulators. Whether it be the accelerated schedule to close B Plant, removal of eight million curies of material from the 300 Area or the improvements we have made to the safe operation of the Plutonium Finishing Plant, our objectives are to reduce the risks posed by Hanford's aging facilities and reduce the cost to taxpayers. Our accomplishments show we are clearly moving in the right direction.

TPA Milestones

1997
100% Completed Early



1998

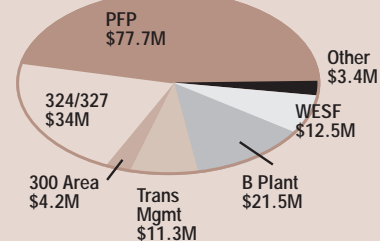


Facility Stabilization completed 100 percent of TPA milestones in 1997. Of 1998 milestones, 55 percent have already been completed early and the balance are on or ahead of schedule.

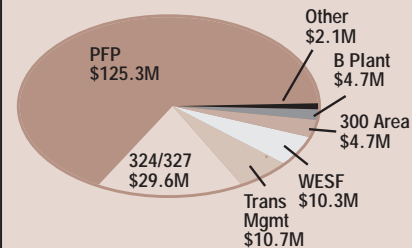
Facility Stabilization manages complex work being done across the Hanford Site.

Facility Stabilization Budget by Project

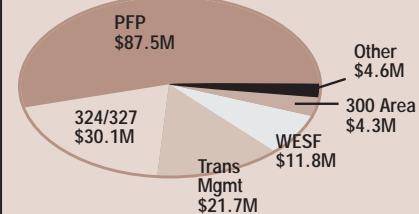
FY 1998



FY 1999



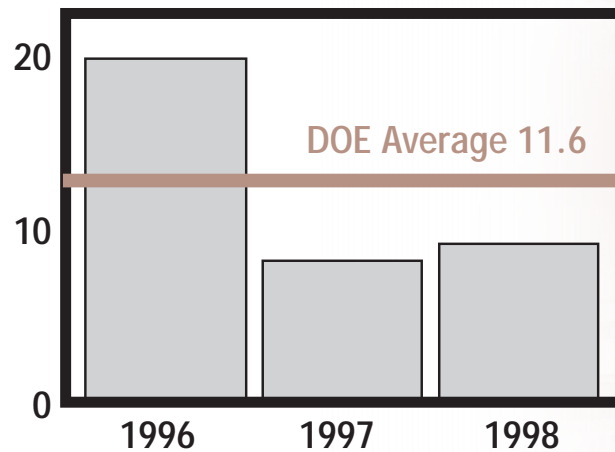
FY 2000



The safety cost index reflects the cost of an employee injury.

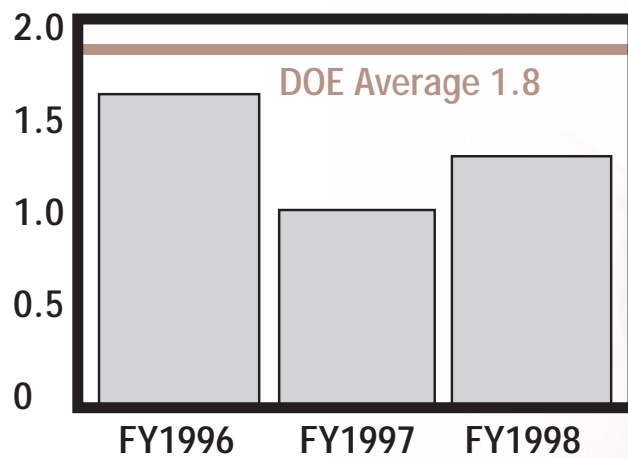
The Facility Stabilization rate has dropped dramatically since the PHMC team took over at the end of 1996. The PHMC continues to keep this cost well below the average of the DOE complex.

FACILITY STABILIZATION SAFETY COST COMPARISON



These incidents reflect injuries that necessitate days away from work and/or days in which scheduled work must be restricted due to personnel injury. Again, the PHMC team has made significant improvements and continues to keep the rate firmly below the standard for the DOE complex.

FACILITY STABILIZATION LOST & RESTRICTED WORKDAY CASE RATE





Bringing Best Commercial Practices to Hanford

